

CLAIMS

[Claim 1]

A timepiece comprising:

a time display to display time information; and

5 a driving power source driving said time display and having a spring including a titanium alloy containing one or more vanadium group (Group Va) elements with an average Young's modulus of 100 GPa or less and a tensile strength of 1000 MPa or greater.

[Claim 2]

10 The timepiece according to claim 1, wherein said spring has a circular cross section with a diameter of 0.05 mm or greater.

[Claim 3]

15 The timepiece according to claim 1, wherein said spring has a rectangular cross section with a thickness of 0.01 mm or greater and a width of 0.05 mm or greater.

[Claim 4]

The timepiece according to claim 1, wherein said spring is made of nonmagnetic material.

[Claim 5]

20 The timepiece according to claim 1, wherein said spring is a mainspring whose freely spread-out shape is an S shape.

[Claim 6]

The timepiece according to claim 5, wherein said spring has an inner end at an end of a winding side, and an outer end at the other end, and

said S shape has an inflection point at which a curving direction changes and which is formed farther inward than a midpoint between said inner end and said outer end.

[Claim 7]

5 The timepiece according to claim 6, wherein said power source has a barrel stem to which said inner end is fixed, a barrel gear to which said outer end is fixed, and a power generator having a rotor that is rotatably driven in conjunction with said barrel gear.

[Claim 8]

10 The timepiece according to claim 1, wherein said titanium alloy contains 20 to 80 mass% of said vanadium group elements per a total of 100 mass% of said titanium alloy.

[Claim 9]

15 The timepiece according to claim 8, wherein said titanium alloy contains 30 to 60 mass% of said vanadium group elements per a total of 100 mass% of said titanium alloy.

[Claim 10]

20 The timepiece according to claim 1, wherein said titanium alloy contains one or more metal elements from the group consisting of zirconium Zr, hafnium Hf, and scandium Sc.

[Claim 11]

 The timepiece according to claim 10, wherein said titanium alloy contains 30 to 60 mass% of said metal element groups per a total of 100 mass% of said titanium alloy.

[Claim 12]

The timepiece according to claim 1, wherein said titanium alloy contains one or more of the elements oxygen O, carbon C, and nitrogen N.

[Claim 13]

5 The timepiece according to claim 12, wherein said titanium alloy contains 2 mass% or less of one or more of the elements oxygen O, carbon C, and nitrogen N per a total of 100 mass% of said titanium alloy.

[Claim 14]

10 The timepiece according to claim 1, wherein said titanium alloy contains boron (B).

[Claim 15]

The timepiece according to claim 14, wherein said titanium alloy contains 2 mass% or less of boron B per a total of 100 mass% of said titanium alloy.

15 [Claim 16]

The timepiece according to claim 1, wherein said titanium alloy contains one or more metal elements from the group consisting of chromium Cr, molybdenum Mo, manganese Mn, iron Fe, cobalt Co, nickel Ni, tin Sn, and aluminum Al.

20 [Claim 17]

The timepiece according to claim 1, wherein said average Young's modulus is 60 GPa or less, and said tensile strength is 1000 MPa or greater.

[Claim 18]

The timepiece according to claim 1, wherein said spring is configured from a single plate.

[Claim 19]

5 The timepiece according to claim 1, wherein said spring is configured from a laminated plate wherein a plurality of titanium alloy plate-shaped members is laminated and integrated.

[Claim 20]

A timepiece comprising:
10 a time display to display time information; and
a power source driving said time display and having a first and second spring including a titanium alloy containing one or more vanadium group (Group Va) elements, with an average Young's modulus of 100 GPa or less and a tensile strength of 1000 MPa or greater, said first and second springs
15 jointly drive the time display.

[Claim 21]

The timepiece according to claim 20, said titanium alloy contains 20 to 80 mass% of the vanadium group elements per a total of 100 mass% of the titanium alloy.

20 [Claim 22]

The timepiece according to claim 20, wherein said titanium alloy contains one or more metal elements from the group consisting of zirconium Zr, hafnium Hf, and scandium Sc.

[Claim 23]

The timepiece according to claim 20, wherein said titanium alloy contains one or more of the elements oxygen O, carbon C, and nitrogen N.

[Claim 24]

5 A timepiece comprising:
a time display to display time information; and
a power source driving said time display and having a balance staff, a balance wheel being fixed to said balance stem, a roller with jewel and stud ball, a hairspring having an inner end being fixed to said stud ball, and a stud
10 support being fixed to an outer end of said hairspring, said hairspring including a titanium alloy containing one or more vanadium group (Group Va) elements, with an average Young's modulus of 100 GPa or less and a tensile strength of 1000 MPa or greater.

[Claim 25]

15 The timepiece according to claim 24, wherein said titanium alloy contains 20 to 80 mass% of the vanadium group elements per a total of 100 mass% of the titanium alloy.

[Claim 26]

20 The timepiece according to claim 24, wherein said titanium alloy contains one or more metal elements from the group consisting of zirconium Zr, hafnium Hf, and scandium Sc.

[Claim 27]

The timepiece according to claim 24, wherein said titanium alloy contains one or more of the elements oxygen O, carbon C, and nitrogen N.

[Claim 28]

A timepiece comprising:

a time display to display time information; and

a power source driving said time display and having a quartz oscillator,

5 a ground plate, and a spring fixing said quartz oscillator to said ground plate, said spring including of a titanium alloy containing one or more vanadium group (Group Va) elements, with an average Young's modulus of 100 GPa or less and a tensile strength of 1000 MPa or greater.

[Claim 29]

10 The timepiece according to claim 28, wherein said titanium alloy contains 20 to 80 mass% of the vanadium group elements per a total of 100 mass% of the titanium alloy.

[Claim 30]

15 The timepiece according to claim 28, wherein said titanium alloy contains one or more metal elements from the group consisting of zirconium Zr, hafnium Hf, and scandium Sc.

[Claim 31]

The timepiece according to claim 28, wherein said titanium alloy contains one or more of the elements oxygen O, carbon C, and nitrogen N.

20.